

SEQUENCE LISTING

<110> Duvick, Jon
Maddox, Joyce
Navarro Acevedo, Pedro
Simmons, Carl R.

<120> Maize Peroxidase Genes and Their Use for
Improving Plant Disease Resistance and Stalk Strength

<130> 35718/242052

<150> US 60/262,595

<151> 2001-01-18

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Arg Arg Asp Gly Leu Ala Pro Ala Ser Asn Ala Ala Val Leu Ala Ala
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ctc cca ccg ccg acg tcc aag gtg ccg acg ctg ctg tcc ttc ctg gcg 203
Leu Pro Pro Pro Thr Ser Lys Val Pro Thr Leu Leu Ser Phe Leu Ala
35 40 45

aag atc aac ctg gac gtg acg gac ctg gtg gcg ctg tcg ggc ggg cac 251
Lys Ile Asn Leu Asp Val Thr Asp Leu Val Ala Leu Ser Gly Gly His
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acg gtg ggc atc gcg cac tgc ggc tcc ttc gac aac cgg ctg ttc ccg 299
Thr Val Gly Ile Ala His Cys Gly Ser Phe Asp Asn Arg Leu Phe Pro
70 75 80

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Thr Gln Asp Pro Thr Leu Asn Lys Phe Phe Ala Gly Gln Leu Tyr Arg

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Thr Cys Pro Thr Asn Ala Thr Val Asn Thr Thr Ala Asn Asp Val Arg			
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Thr Pro Asn Ala Phe Asp Asn Lys Tyr Tyr Val Asp Leu Leu Asn Arg			
115	120	125	
gag ggc ctc ttc acg tcg gac cag gac ctg ctg acc aac gcc acc acg			491
Glu Gly Leu Phe Thr Ser Asp Gln Asp Leu Leu Thr Asn Ala Thr Thr			
130	135	140	145
cgc ccc atc gtc acg cgc ttc gcc gtc gac cag gac gcc ttc ttc gac			539
Arg Pro Ile Val Thr Arg Phe Ala Val Asp Gln Asp Ala Phe Phe Asp			
150	155	160	
cag ttc gtc tac tcc tac gtc aag atg ggg cag gtc aac gtg ctc acg			587
Gln Phe Val Tyr Ser Tyr Val Lys Met Gly Gln Val Asn Val Leu Thr			
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ggc tcc cag gga cag gtc cgc gcc aac tgc tcc gcg cgc aac ggc gcc			635
Gly Ser Gln Gly Gln Val Arg Ala Asn Cys Ser Ala Arg Asn Gly Ala			
180	185	190	
gct gct ggt gac agt gac ctg ccg tgg tcg tcc gtc gtc atc gag aca			683
Ala Ala Gly Asp Ser Asp Leu Pro Trp Ser Ser Val Val Ile Glu Thr			
195	200	205	
gtc gcc gac gcc gcc ggt agc ctc gtg ctc tag ataataagca aataagtagt			736
Val Ala Asp Ala Ala Gly Ser Leu Val Leu *			
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 Ala Lys Ile Asn Leu Asp Val Thr Asp Leu Val Ala Leu Ser Gly Gly
 50 55 60
 His Thr Val Gly Ile Ala His Cys Gly Ser Phe Asp Asn Arg Leu Phe
 65 70 75 80
 Pro Thr Gln Asp Pro Thr Leu Asn Lys Phe Phe Ala Gly Gln Leu Tyr
 85 90 95
 Arg Thr Cys Pro Thr Asn Ala Thr Val Asn Thr Thr Ala Asn Asp Val
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Arg Thr Pro Asn Ala Phe Asp Asn Lys Tyr Tyr Val Asp Leu Leu Asn
 115 120 125
 Arg Glu Gly Leu Phe Thr Ser Asp Gln Asp Leu Leu Thr Asn Ala Thr
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 145 150 155 160
 Asp Gln Phe Val Tyr Ser Tyr Val Lys Met Gly Gln Val Asn Val Leu
 165 170 175
 Thr Gly Ser Gln Gly Gln Val Arg Ala Asn Cys Ser Ala Arg Asn Gly
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 Met Ala Ser Pro Thr Leu Met Gln Cys Leu Val Ala Val Ser
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 Leu Leu Ser Cys Val Ala His Ala Gln Leu Ser Pro Thr Phe Tyr Ala
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 tcc tcc tgc ccc aac ctg cag agc atc gtt cgg gcg gcg atg acc cag 204
 Ser Ser Cys Pro Asn Leu Gln Ser Ile Val Arg Ala Ala Met Thr Gln
 35 40 45

 gcc gtc gca agt gag cag agg atg ggc gcc tct ctg ctc agg ctc ttc 252
 Ala Val Ala Ser Glu Gln Arg Met Gly Ala Ser Leu Leu Arg Leu Phe
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 ttc cac gac tgc ttc gtt caa ggc tgc gac gga tcg atc ctt ctc gac 300
 Phe His Asp Cys Phe Val Gln Gly Cys Asp Gly Ser Ile Leu Leu Asp
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 gcc gga ggg gag aag acc gcc ggg ccg aac ctg aac tcg gtg cgc ggc 348
 Ala Gly Gly Glu Lys Thr Ala Gly Pro Asn Leu Asn Ser Val Arg Gly
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 Phe Glu Val Ile Asp Thr Ile Lys Arg Asn Val Glu Ala Ala Cys Pro
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 Gly Val Val Ser Cys Ala Asp Ile Leu Ala Leu Ala Ala Arg Asp Gly

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Thr Asn Leu Leu Gly Gly Pro Thr Trp Ser Val Pro Leu Gly Arg Arg			
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gac tcg acg acg gcc agc gcc tcg ctc gcc aac agc aac ccc ccg ccc			540
Asp Ser Thr Thr Ala Ser Ala Ser Leu Ala Asn Ser Asn Pro Pro Pro			
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ccg acg gcc agc ctc ggc acg ctc atc tcc ctg ttc ggc agg cag ggc			588
Pro Thr Ala Ser Leu Gly Thr Leu Ile Ser Leu Phe Gly Arg Gln Gly			
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Leu Ser Pro Arg Asp Met Thr Ala Leu Ser Gly Ala His Thr Ile Gly			
175	180	185	190
cag gcc cgg tgc acc acc ttc cgc ggc cgc atc tac ggc gac acc gac			684
Gln Ala Arg Cys Thr Thr Phe Arg Gly Arg Ile Tyr Gly Asp Thr Asp			
195	200	205	
atc aac gcc tcc ttc gcg gcg ctg cgg cag cag acg tgc ccg cgg tcc			732
Ile Asn Ala Ser Phe Ala Ala Leu Arg Gln Gln Thr Cys Pro Arg Ser			
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ggc ggc gac ggc aac ctg gcg ccc atc gac gtg cag acg ccg gtg agg			780
Gly Gly Asp Gly Asn Leu Ala Pro Ile Asp Val Gln Thr Pro Val Arg			
225	230	235	
ttc gac acg gcc tac ttc acc aac ctg ctg tcg cgg cgg ggc ctg ttc			828
Phe Asp Thr Ala Tyr Phe Thr Asn Leu Leu Ser Arg Arg Gly Leu Phe			
240	245	250	
cac tcg gac cag gag ctc ttc aac ggc ggg tcg cag gac gcg ctg gtg			876
His Ser Asp Gln Glu Leu Phe Asn Gly Gly Ser Gln Asp Ala Leu Val			
255	260	265	270
agg cag tac agc gcc agc gcc tcg ctc ttc aac gcc gac ttc gtg gca			924
Arg Gln Tyr Ser Ala Ser Ala Ser Leu Phe Asn Ala Asp Phe Val Ala			
275	280	285	
gcc atg att agg atg ggc aac gtt ggg gtg ctc acc ggc acc gcc gga			972
Ala Met Ile Arg Met Gly Asn Val Gly Val Leu Thr Gly Thr Ala Gly			
290	295	300	
cag atc agg cgc aac tgc cgg gtc gtc aac agc tag ataccgacgca			1018
Gln Ile Arg Arg Asn Cys Arg Val Val Asn Ser *			
305	310		
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gatagatcga ccgacataga gctcgcttct gatgaacccc agtacgtgta ctctctagta			1138
tatatacata gatatagcta tagattgaac acgtcgtcaa taccagtaga ataagtgggtg			1198
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 35 40 45
 Ala Ser Glu Gln Arg Met Gly Ala Ser Leu Leu Arg Leu Phe Phe His
 50 55 60
 Asp Cys Phe Val Gln Gly Cys Asp Gly Ser Ile Leu Leu Asp Ala Gly
 65 70 75 80
 Gly Glu Lys Thr Ala Gly Pro Asn Leu Asn Ser Val Arg Gly Phe Glu
 85 90 95
 Val Ile Asp Thr Ile Lys Arg Asn Val Glu Ala Ala Cys Pro Gly Val
 100 105 110
 Val Ser Cys Ala Asp Ile Leu Ala Leu Ala Ala Arg Asp Gly Thr Asn
 115 120 125
 Leu Leu Gly Gly Pro Thr Trp Ser Val Pro Leu Gly Arg Arg Asp Ser
 130 135 140
 Thr Thr Ala Ser Ala Ser Leu Ala Asn Ser Asn Pro Pro Pro Pro Thr
 145 150 155 160
 Ala Ser Leu Gly Thr Leu Ile Ser Leu Phe Gly Arg Gln Gly Leu Ser
 165 170 175
 Pro Arg Asp Met Thr Ala Leu Ser Gly Ala His Thr Ile Gly Gln Ala
 180 185 190
 Arg Cys Thr Thr Phe Arg Gly Arg Ile Tyr Gly Asp Thr Asp Ile Asn
 195 200 205
 Ala Ser Phe Ala Ala Leu Arg Gln Gln Thr Cys Pro Arg Ser Gly Gly
 210 215 220
 Asp Gly Asn Leu Ala Pro Ile Asp Val Gln Thr Pro Val Arg Phe Asp
 225 230 235 240
 Thr Ala Tyr Phe Thr Asn Leu Leu Ser Arg Arg Gly Leu Phe His Ser
 245 250 255
 Asp Gln Glu Leu Phe Asn Gly Gly Ser Gln Asp Ala Leu Val Arg Gln
 260 265 270
 Tyr Ser Ala Ser Ala Ser Leu Phe Asn Ala Asp Phe Val Ala Ala Met
 275 280 285
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148	gcc acg gty acc gty aat gag ccc atc gcc aat gcc ctc tcc tgg agc Ala Thr Val Thr Val Asn Gln Pro Ile Ala Asn Gly Leu Ser Trp Ser	25	40
196	ttc tac gac gtt tcc tgc ccg tcy gty gag ggc atc gty cgc tgg cac Phe Tyr Asp Val Ser Cys Pro Ser Val Gln Gly Ile Val Arg Trp His	45	55
244	gtc gcc gag gcc ctc cgc gcc gac atc gcc atc ggc ile gty ile ala ala gty leu ile Val Ala Gln Ala Leu Arg Arg Asp Ile Gly Ile Ala Ala Gln Ile	60	70
292	cgc atc ttc ttc cac gac tgc ttc ccg cag ggc tgc gac gcy tcc gtc Arg Ile Phe Phe His Asp Cys Phe Pro Gln Gly Cys Asp Ala Ser Val	75	85
340	ctc cty tct ggt tcc aac agc gag cag atc gag gta ccc aac cag acg Leu Leu Ser Gly Ser Asn Ser Gln Gln Ile Gln Val Pro Asn Gln Thr	90	100
388	ctg cgt ccc gag gcc ctc aag ctc atc gac gac atc ggc ggc gcc gtc Leu Arg Pro Gln Ala Leu Lys Leu Ile Asp Asp Ile Arg Ala Val	110	120
436	cac gcc gtc tgc tgc ggc ccc acg gty tcc tgc gcc gac atc aca acg ctc His Ala Val Cys Gly Pro Thr Val Ser Cys Ala Asp Ile Thr Thr Leu	125	135
484	gcc acc agg gac gcc gtc gtc ggc tcc ggc ggc ccc ttc ttc gag gtt Ala Thr Arg Asp Ala Val Ala Ser Gly Gln Val	140	150
532	cct ctc ggg cgc ggc gac ggt cty gcy gcc gcc gcc tca agc gac cty gty Pro Leu Gly Arg Arg Asp Gly Leu Ala Pro Ala Ser Ser Asp Leu Val	155	165
580	ggc acc cty ccy gcc ccc ttc ttc gac gty ccy gcc cty acg gac gty tcy Gly Thr Leu Pro Ala Pro Phe Phe Asp Val Pro Thr Leu Ile Gln Ser	170	180
628	ttc aag aac cgc agc cty gac aag gcc gac cty gac gac cty gty gty gcy Phe Lys Asn Arg Ser Leu Asp Lys Ala Asp Leu Val Ala Leu Ser Gly	185	200
676	gcy cac acg gty ggc cgc ggc cac tgc gtt tcc ttc agc gac ccy cty Ala His Thr Val Gly Arg Gly His Cys Val Ser Phe Ser Asp Arg Leu	205	215

724 ccc ccc aac gac gat ggc acc atg gac ccg ggc ttc cgg cag agg
Pro Pro Asn Ala Asp Asp Gly Thr Met Asp Pro Ala Phe Arg Gln Arg
220 225 230

772 ctc agc gcc aag tgc gcc agc gac ccc agc ggg aac gtc gtc acc cag
Leu Thr Ala Lys Cys Ala Ser Asp Pro Ser Gly Asn Val Thr Gln
235 240 245

820 gtc ctg gac gtc cgc acc aac gcc ttc gac aac aag tac tac ttc
Val Leu Asp Val Arg Thr Pro Asn Ala Phe Asp Asn Lys Tyr Tyr Phe
250 255 260

868 gac ctt atc gcc aag cag ggg ctc ttc aag tcc gac ggc ctc atc
Asp Leu Ile Ala Lys Gln Phe Lys Ser Asp Gln Gly Leu Ile
265 270 275 280

916 aac cac ccg gac acc aag cgc gcc acc cgc ttc ggc ctc aac cag
Asn His Pro Asp Thr Lys Arg Ala Thr Arg Phe Ala Leu Asn Gln
285 290 295

964 gcc gcc ttc ttc gac cag ttc gcc agc tcc atg gtc aag atg agc cag
Ala Ala Phe Phe Asp Gln Phe Ala Arg Ser Met Val Lys Met Ser Gln
300 305 310

1012 atg gac atc ctc acc gcc agc gcc ggc gga gag atc cgc aac tgc tcc
Met Asp Ile Leu Thr Gly Ser Ala Gly Gln Ile Arg Arg Asn Cys Ser
315 320 325

1060 gtc cgc aac acc gcc ctc gga gat gtc tca tcc ggc cag ctc gag
Val Arg Asn Thr Ala Leu Gly Asp Val Ser Ser Ala Gln Leu Gln
330 335 340

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Thr Thr Ala Gly Asp Gln Gly Leu Ala Ala Asp Ala *
345 350 355

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1263 aaaaaaaa aaaaaaaa aaaaa

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35 40 45
Val Gln Gly Ile Val Arg Trp His Val Ala Gln Ala Leu Arg Arg Asp
50 55 60
Ile Gly Ile Ala Ala Gly Leu Ile Arg Ile Phe Phe His Asp Cys Phe
65 70 75 80
Pro Gln Gly Cys Asp Ala Ser Val Leu Leu Ser Gly Ser Asn Ser Gln

85 90 95
Gln Ile Glu Val Pro Asn Gln Thr Leu Arg Pro Glu Ala Leu Lys Leu
100 105 110
Ile Asp Asp Ile Arg Ala Val His Ala Val Cys Gly Pro Thr Val
115 120 125
Ser Cys Ala Asp Ile Thr Thr Leu Ala Thr Arg Asp Ala Val Val Ala
130 135 140
Ser Gly Gly Pro Phe Phe Glu Val Pro Leu Gly Arg Asp Gly Leu
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Ala Pro Ala Ser Ser Asp Leu Val Gly Thr Leu Pro Ala Pro Phe
160 170 175
Asp Val Pro Thr Leu Ile Glu Ser Phe Lys Asn Arg Ser Leu Asp Lys
180 185 190
Ala Asp Leu Val Ala Leu Ser Gly Ala His Thr Val Gly Arg Gly His
195 200 205
Cys Val Ser Phe Ser Asp Arg Leu Pro Pro Asn Ala Asp Gly Thr
210 215 220
Met Asp Pro Ala Phe Arg Gln Arg Leu Thr Ala Lys Cys Ala Ser Asp
225 230 235
Pro Ser Gly Asn Val Val Thr Gln Val Leu Asp Val Arg Thr Pro Asn
245 250 255
Ala Phe Asp Asn Lys Tyr Tyr Phe Asp Leu Ile Ala Lys Gln Gly Leu
260 265 270
Phe Lys Ser Asp Gln Gly Leu Ile Asn His Pro Asp Thr Lys Arg Ala
275 280 285
Ala Thr Arg Phe Ala Leu Asn Gln Ala Ala Phe Phe Asp Gln Phe Ala
290 295 300
Arg Ser Met Val Lys Met Ser Gln Met Asp Ile Leu Thr Gly Ser Ala
305 310 315
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gtggcgagcag cagcagcctg cgccct atg tac act gca atg gca gcg cga ccg
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Met Tyr Thr Ala Met Ala Ala Arg Pro
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Leu Leu Leu Pro Pro Val Leu Leu Leu Leu Leu Val Ala Val
15
20
25
220

[illegible]

[illegible]

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414	tgg gcg cag gtc gcc gcc aac cct gcc ctc ctc cgc gct cgc ctc cgc	Trp Ala Gln Val Ala Asn Pro Ala Leu Pro Ala Arg Leu Leu Arg	75	80	85
462	ctc cac ttc cat gac tgc ttc gtc aag ggc tgc gac gcg tgc atc ctg	Leu His Phe His Asp Cys Phe Val Lys Gly Cys Asp Ala Ser Ile Leu	90	95	100
510	ctg gac acc gcc cag agc gag aag gac ggc ggc ggc ggc aac ctg gtc	Leu Asp Thr Ala Gln Ser Gln Lys Thr Ala Ala Pro Asn Leu Ser Val	105	110	115
558	ggc ggg tac gag gtc atc gac ggc atc aag ggc cag ctg gag agg gcg	Gly Gly Tyr Gln Val Ile Asp Ala Ile Lys Ala Gln Leu Gln Arg Ala	120	125	130
606	tgc ccg ggc gtc gtc gtc gtc gtc gtc gtc gtc gtc gtc gtc gtc gtc	Cys Pro Gly Val Val Ser Cys Ala Asp Ile Val Ala Leu Ala Ala Arg	140	145	150
654	gac gcc gtc tgc tac cag ttc aag ggc tgc ctg tgg cag gtc gag acg	Asp Ala Val Ser Tyr Gln Phe Lys Ala Ser Leu Trp Gln Val Gln Thr	155	160	165
702	ggg cgg arg ggc gac ggc acg gtc gtc gtc gtc gtc gtc gtc gtc gtc	Gly Arg Arg Asp Gly Thr Val Ser Leu Ala Ser Asn Thr Gly Ala Leu	170	175	180
750	ccg tgc ccc ttc ggc ggc ttc ggc ggc ttc ggc ggc ggc ggc ggc ggc	Pro Ser Pro Phe Ala Gly Phe Ala Gly Leu Leu Gln Ser Phe Ser Asp	185	190	195
798	cgg ggg ctg aac ctg acg gac ctc gtc ggc ggc ggc ggc ggc ggc ggc	Arg Gly Leu Asn Leu Thr Asp Leu Val Ala Leu Ser Gly Ala His Thr	200	205	210
846	atc ggc gtc gca agc tgc tcc agc gtc acc cgc ctg ggc ctg tac cag	Ile Gly Val Ala Ser Cys Ser Ser Val Thr Pro Arg Leu Tyr Gln Gly	220	225	230
894	aac gcc agc agc gtc gac cgc ctg ctg gac tgc ggc tac ggc cgc agc	Asn Ala Ser Ser Val Asp Pro Leu Leu Asp Ser Ala Tyr Ala Arg Thr	235	240	245
942	ctc atg tgc tgc tgc tgc ccc aac cgc ctg ggc ggc ggc ggc ggc ggc	Leu Met Ser Ser Cys Pro Asn Pro Ser Pro Ala Ser Ala Thr Val Ala	250	255	260
990	ctg gac ggc ggc ggc acg cgc ttc cgc ggc ttc gac agc agt tac tcc	Leu Asp Gly Gly Thr Pro Phe Arg phe Asp Ser Ser Tyr Tyr Ser Arg	265	270	275

1038	gtg	Val	280
	cag	Gln	
	cag	Gln	
	aag	Lys	285
	cag	Gln	
	gyc	GLY	
	acg	Thr	
	ctg	Leu	
	gcc	Ala	
	tcc	Ser	290
	gac	Asp	
	gcc	Ala	
	gcg	Ala	
	ctg	Leu	
	gcg	Ala	295
	cag	Gln	

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Asn Thr Ser * 345

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1474							
1414	ctcgcagaa	agaaatccat	tgcttctct	gtctatctat	ctcgtttacat	caactgtacctg	
1354	cggtctcgcc	tcgaatcgca	tcgtccccc	cgccgttctc	gagggccctc		
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Leu	Gly	His	Leu	Pro	Ser	Cys	Ala	Arg	Ala	Gly	Leu	30
Pro	Gly	Leu	Ala	Tyr	Asn	phe	Lys	Asn	Ser	Cys	Pro	45
Ser	Ile	Val	Arg	Ser	Val	Trp	Ala	Gln	Val	Ala	Asn	60
Leu	Pro	Ala	Arg	Leu	Leu	Arg	Leu	His	phe	His	75	
Gly	Cys	Asp	Ala	Ser	Ile	Leu	Asp	Thr	Ala	Gln	Ser	90
Ala	Pro	Asn	Leu	Ser	Val	Gly	Tyr	Gln	Val	Ile	Asp	110
Lys	Ala	Gln	Leu	Gln	Arg	Ala	Cys	Pro	Gly	Val	Ala	125
Ile	Val	Ala	Leu	Ala	Ala	Arg	Ala	Val	Ser	Tyr	Gln	140
Ser	Leu	Trp	Gln	Val	Glu	Thr	Gly	Arg	Asp	Gly	Thr	155
Ala	Ser	Asn	Thr	Gly	Ala	Leu	Pro	Ser	Pro	phe	Ala	170
Leu	Gln	Ser	180									185
Phe	Ser	180										
Ser	Asp	Arg	Gly	Leu	185							
Val	Leu	Val	190									

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 Thr Pro Arg Leu Tyr Gln Gly Asn Ala Ser Ser Val Asp Pro Leu Leu
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 Asp Ser Ala Tyr Ala Arg Thr Leu Met Ser Ser Cys Pro Asn Pro Ser
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 Pro Ala Ser Ala Thr Val Ala Leu Asp Gly Thr Pro Phe Arg Phe
 260
 Asp Ser Ser Tyr Ser Arg Val Gln Gln Lys Gln Gly Thr Leu Ala
 275
 Ser Asp Ala Leu Ala Gln Asn Ala Ala Ala Gln Met Val Ala
 290
 Asp Leu Thr Asn Pro Ile Lys Phe Tyr Ala Phe Ser Met Ser Met
 305
 Lys Lys Met Gly Arg Val Asp Val Leu Thr Gly Ala Asn Gly Gln Ile
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 Arg Lys Gln Cys Arg Gln Val Asn Thr Ser
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aag gcc gtc ctc gag gcc cac tgc ccg cgc acc gtc tcc tgc gcc gag	115	120	125
Lys Ala Val Leu Gln Ala His Cys Pro Arg Thr Val Ser Cys Ala Asp	130	135	140
atc gtc ggc ttc gca gcc ggt gag agc gcc tac ctc gcc ggc ggc ctg	145	150	155
Ile Val Ala Phe Ala Ala Arg Asp Ser Ala Tyr Leu Ala Gly Gly Leu	160	165	170
gat gag gtc ctc gag aac aat gtc cct gcc ccg act gag gag gtc gag	175	180	185
asp gln val leu asp asn asn val pro ala pro thr asp gln val asp	190	195	200
gag ctc atc gag agc ttc aag cgc aag ggc ctc aac gcc gag gat atg	205	210	215
Glu Leu Ile Gln Ser Phe Lys Arg Lys Gly Leu Asn Ala Asp Met	220	225	230
gtc acg ctc tct ggc gcc cac acc atc ggc cgc tcc cac tgc tcc tcg	235	240	245
Val Thr Leu Ser Gly Ala His Thr Ile Gly Arg Ser Ser His Cys Ser Ser	250	255	260
ttc acg gag cgc ttc tac aac ttc agc ggc agc ggc agc ggc agc ggc	265	270	275
Phe Thr Gln Arg Leu Tyr Asn Phe Ser Gly Gln Leu Gly Arg Thr Asp	280	285	290
ccg tcc ctc gag cct gcc tac gct gag cac ctc aag atg cgc tgc cca	295	300	305
Pro Ser Leu Asp Pro Ala Tyr Ala Gln His Leu Lys Met Arg Cys Pro	310	315	320
ccg gtc acg ccg gcc acc ttc gag aac cag tac tac aag aac gtc ctg	325	330	335
cca gtc acg ccg gcc acc ttc gag aac cag tac tac aag aac gtc ctg	340	345	350
Pro Val Thr Pro Ala Thr Phe Asp Asn Gln Tyr Tyr Lys Asn Val Leu	355	360	365
gag cac aag gtc ctg ttc atc tcc gag aac aca ctc gtc gaa aac cca	370	375	380
Ala His Lys Val Leu Phe Ile Ser Asp Asn Thr Leu Leu Gln Asn Pro	385	390	395
tg9 act gcc ggc gga atg gtc cac ttc aac gcc gca gtc gag aag gca tg9	400	405	410
Trp Thr Ala Gly Met Val His Phe Asn Ala Ala Val Gln Lys Ala Trp	415	420	425
cag gtc aag ttc gcc aag gcc atg gtc aag atg ggc aag gtc cag gtc	430	435	440
Gln Val Lys Phe Ala Lys Ala Met Val Lys Met Gly Lys Val Gln Val	445	450	455
305	310	315	320
ctc acc gcc ggc gag gga gag atc agg gag aag tgc ttc gcc gtc aac	460	465	470
Leu Thr Gly Asp Gln Gly Ile Arg Gln Lys Cys Phe Ala Val Asn	475	480	485

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Asn Ala Val Arg Arg Gly Ile Ala Arg Gln Pro Gly Val Gly Ala Gly
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Leu Ile Arg Met His Phe His Asp Cys Phe Val Arg Gly Cys Asp Gly
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Ser Ile Leu Ile Asn Ser Thr Pro Asp Asn Lys Ala Gln Lys Asp Ser
85 90 95

Val Ala Asn Asn Pro Ser Met Arg Gly Phe Asp Val Val Asp Asp Ala
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Lys Ala Val Leu Gln Ala His Cys Pro Arg Thr Val Ser Cys Ala Asp
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Ile Val Ala Phe Ala Ala Arg Asp Ser Ala Tyr Leu Ala Gly Gly Leu
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Asp Tyr Lys Val Pro Ser Gly Arg Asp Gly Arg Val Ser Lys Gln
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Asp Gln Val Leu Asp Asn Asn Val Pro Ala Pro Thr Asp Gln Val Asp
165 170 175

Gln Leu Ile Gln Ser Phe Lys Arg Lys Gly Leu Asn Ala Asp Asp Met
180 185 190 195

Val Thr Leu Ser Gly Ala His Thr Ile Gly Arg Ser His Cys Ser Ser
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Phe Thr Gln Arg Leu Tyr Asn Phe Ser Gly Gln Leu Gly Arg Thr Asp
210 215 220

Pro Ser Leu Asp Pro Ala Tyr Ala Gln His Leu Lys Met Arg Cys Pro
225 230 235 240

Trp Pro Ser Ser Ser Asn Asp Gln Met Asp Pro Thr Val Pro Leu Asp
245 250 255

Pro Val Thr Thr Pro Ala Thr Phe Asp Asn Gln Tyr Tyr Lys Asn Val Leu
260 265 270

Ala His Lys Val Leu Phe Ile Ser Asp Asn Thr Leu Leu Gln Asn Pro
275 280 285

Trp Thr Ala Gly Met Val His Phe Asn Ala Ala Val Gln Lys Ala Trp
290 295 300

Gln Val Lys Phe Ala Lys Ala Met Val Lys Met Gly Lys Val Gln Val
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Leu Thr Gly Asp Gln Gly Gln Ile Arg Gln Lys Cys Phe Ala Val Asn
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Pro His Tyr

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cccccccctc cctctctatc c atg gcg gtc ccc cgc ggg tgc ctc ggg ctc
Met Ala Val Pro Arg Gly Cys Leu Gly Leu
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ccc ctg gtc gcc gtc ctc ctc gtc tcc ctc tgc cgc ggc cag gcg gcg
Pro Leu Val Ala Val Leu Leu Ala Ser Leu Cys Arg Gly Gln Ala Ala
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gtg agg gag ctc aag gtc ggg tac tac gcc gag acg tgc ccg gag gcc
Val Arg Gln Leu Lys Val Gly Tyr Tyr Ala Gln Thr Cys Pro Gln Ala
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gag gac atc gtc cgt gag acc atg gcg cgc ggc ggc gca cgc gag gcc
Glu Asp Ile Val Arg Gln Thr Met Ala Arg Ala Arg Gln Ala
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cgc agc gtc gcc tcc gtc atg cgc ctc cag ttc cac gac tgc ttc gtc
Arg Ser Val Ala Ser Val Met Arg Leu Gln Phe His Asp Cys Phe Val
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aac ggg tgc gag ggc tgc gtc atg gag gcc agc cgc agc atg ccc
Asn Gly Cys Asp Gly Ser Val Leu Met Asp Ala Thr Pro Thr Met Pro
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ggc gag aag gat ggc atc aac tcc aac atc aac tcc ctg cgc ttc gag
Gly Gln Lys Asp Ala Leu Ser Asn Ile Asn Ser Leu Arg Ser Phe Gln
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gtc gtc gag gac gag atc aag gag gac gcg ctc gag gag cgc tgc ccc gga gtc
Val Val Asp Gln Ile Lys Asp Ala Leu Gln Gln Arg Cys Pro Gly Val
110
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gtc tcc tgc gcc gac atc gtc atc atg gcc gcc ggc gac ggc gtc gtc
Val Ser Cys Ala Asp Ile Val Ile Met Ala Ala Arg Asp Ala Val Val
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ctg acc ggt ggg cct aac tgg gag gtc cgc ggc ggc ggc gag gac agc
Leu Thr Gly Gly Pro Asn Trp Gln Val Arg Leu Gly Arg Gln Asp Ser
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atg acg gcg agc cag gag gac gcg gac aac atc atg ccg agc ccg cgc
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155	Met Thr Ala Ser Gln Gln	160	165	170
699	Gca aac gcg agc gct ctc atc cgg ctc ttc gcg ggg ctc aac ctc agc Ala Asn Ala Ser Ala Leu Ile Arg Leu Phe Ala Gly Leu Asn Leu Ser	175	180	185
747	gtc acc gac ctg gtc gcg ctc ttc ggc ggc ttc gac cac tcc atc ggc gag ggc Val Thr Asp Leu Val Ala Leu Ser Gly Ser His Ser Ile Gly Gln Ala	190	195	200
795	cgc tgc ttc ttc atc gtc ttc cgc ctc tac aac cag tct gga tcc ggc Arg Cys Phe Ser Ile Val Phe Arg Leu Tyr Asn Gln Ser Gly Ser Gly	205	210	215
843	cgc ccc gac ccg cac atg gac acc gcc tac cgc cgc tcc gac gca Arg Pro Asp Pro His Met Asp Thr Ala Tyr Arg Arg Ser Leu Asp Ala	220	225	230
891	ctc tgc ccc aag ggc ggc gac gag gtc acg gga ggc cta gac gcc Leu Cys Pro Lys Gly Asp Gln Val Thr Gly Leu Asp Ala	240	245	250
939	acc cca cgc gtc ttc gac aac cag tac ttc gag gac ctc gtc gcg ctc Thr Pro Arg Val Phe Asp Asn Gln Tyr Phe Gln Asp Leu Val Ala Leu	255	260	265
987	cgc ggc ttc ctc aac tcc gac cag acg ctc ttc tct gac aac acc agg Arg Gly Phe Leu Asn Ser Asp Gln Thr Leu Phe Ser Asp Asn Thr Arg	270	275	280
1035	acc cgt cgc gtc gtc gac cgc atc agc aag gac cag gac gcc ttc ttc Thr Arg Arg Val Val Gln Arg Leu Ser Lys Asp Gln Asp Ala Phe Phe	285	290	295
1083	agg gcc ttc atc gag ggg atg ata aag atg ggg gag ctc caa aac ccc Arg Ala Phe Ile Gln Gly Met Ile Lys Met Gly Gln Leu Gln Asn Pro	300	305	310
1131	agg aaa ggg gag ata cgg cgc aac tgt cgc gtt gct aac aac tcc ccg Arg Lys Gly Gln Ile Arg Arg Asn Cys Arg Val Ala Asn Asn Ser Pro	320	325	330
1179	tgg caa cca agg acg ggg atg gcg tcc gga cag tcc aca tct gag ctc Trp Gln Pro Arg Thr Gly Met Ala Ser Gly Gln Ser Thr Ser Gln Leu	335	340	345
1235	cgg tga tgaagtgtgt gtttcagaag aatcagacc ctgatatgtt actaatatgt			
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1121	ata gac gat cct gcg caa tcg tat cgt acg tgc atg ata cgc ata cat	Ile Asp Asp Pro Ala Gln Ser Tyr Arg Thr Cys Met Ile Arg Ile His	330	335	340
1169	ctg gaa act act ata cca atg caa aca gag atc tat acg tac gag tat	Leu Gln Thr Thr Ile Pro Met Gln Thr Gln Ile Tyr Thr Tyr Gln Tyr	350	355	360
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1285	gcgcaaaaggc gcgcgttggg agattaatta gytacacaag ctattaccac attatatac	actctcatg tggctacata tctatatc tcgagccaaa tgccttgggtg tccagtacta			
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180	185	190	Gly Ala His Thr Ile Gly Gln Ala Gln Cys Ser Ser Phe Asn Gly His	195	200	205	Ile Tyr Asn Asp Thr Asn Ile Asn Ala Phe Ala Thr Ser Leu Lys	210	215	220	Ala Asn Cys Pro Met Ser Gly Ser Ser Leu Ala Pro Leu Asp Thr	225	230	235	Met Thr Pro Thr Val Phe Asn Asp Tyr Tyr Lys Asn Leu Ser	240	245	250	255	Gln Lys Gly Leu Leu His Ser Asp Gln Gln Leu Phe Asn Asn Gly Ser	260	265	270	275	280	285	Thr Asp Ser Thr Val Ser Asn Phe Ala Ser Ser Phe Gly Arg Leu His	290	295	300	Gln Arg Leu His Gly His Gly Gln Asp Gly Gln Pro Arg Pro Ala	305	310	315	His Arg Asp Gln Trp Ala Asp Gln Ala His Leu Leu Gln Ala Gln Leu	320	325	330	Val Leu Ile Ile Lys Asp Gly Arg Pro Ile Asp Asp Pro Ala Gln Ser	335	340	345	Tyr Arg Thr Cys Met Ile Arg Ile His Leu Gln Thr Thr Ile Pro Met	350	355	360	Gln Thr Gln Ile Tyr Thr Tyr Gln Tyr Val
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597	acc gtg tcc atc aag cag gac ggc ggc ggc ggc ggc ggc ggc acc	Thr Val Ser Ile Lys Glu Glu Ala Leu Asp Glu Ile Pro Ala Pro Thr	150	
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				160
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693	ctc gcc gac ctc gtc tgg ctc tca ggc gct cac acg atc ggc atc tcc	Leu Ala Asp Leu Val Trp Leu Ser Gly Ala His Thr Ile Gly Ile Ser	180	
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885	atg gac ccc ggc agc ttc cgc acc ttc gac ctg agc tac tac cgc ggc	Met Asp Pro Gly Ser Phe Arg Thr Phe Asp Leu Ser Tyr Tyr Arg Gly	245	
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				255
933	gtg ctc aag cgg cgg ggc ctg ttc cag tcc gac ggc ggc ggc ctc atc acc	Val Leu Lys Arg Gly Leu Phe Gln Ser Asp Ala Ala Leu Ile Thr	260	
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981	gac gcc gcc tcc aag gcc gac atc ctc agc gtc atc aac ggc cgc ccc	Asp Ala Ala Ser Lys Ala Asp Ile Leu Ser Val Ile Asn Ala Pro Pro	280	
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1029	gag gtg ttc ttc cag gtc ttc gcg ggc tcc atg gtc aag atg ggc gcc	Glu Val Phe Phe Gln Val Phe Ala Gly Ser Met Val Lys Met Gly Ala	295	

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Ile Glu Val Lys Thr Gly Ser Glu Gly Ile Arg Lys His Cys Ala	310
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Leu Val Asn Lys His *	325
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Pro His Ala Pro Asp Val Ala Ser Thr Leu Leu Arg Thr His Phe His	50
Asp Cys Phe Val Arg Gly Cys Asp Ala Ser Val Leu Leu Asn Ala Thr	65
Gly Gly Ser Glu Ala Glu Lys Asp Ala Ala Pro Asn Leu Thr Leu Arg	80
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Gly Phe Gly Phe Ile Asp Arg Ile Lys Ala Leu Leu Glu Lys Glu Cys	110
Pro Gly Val Val Ser Cys Ala Asp Ile Val Ala Leu Ala Arg Asp	125
Ser Val Gly Val Ile Gly Gly Pro Phe Trp Ser Val Pro Thr Gly Arg	140
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Ala Ala Lys Leu Arg Leu Lys Cys Lys Thr Leu Thr Asp Asn Thr Thr	230
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Tyr Arg Gly Val Leu Lys Arg Arg Gly Leu Phe Glu Ser Asp Ala Ala	270

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 thr gly ala asn ser leu ala asp val asp pro ala leu asp ala ala
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Lys Ala Ala Pro Thr Leu Ala Gly Pro Leu Leu Arg Leu His Phe His
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Asp Cys Phe Val Arg Gly Cys Asp Ala Ser Val Leu Leu Asp Ser Thr
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Pro Gly Asn Val Ser Cys Ala Asp Val Leu Ala Leu Met Ala Arg Asp
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Ala Val Val Leu Ala Asn Gly Pro Ser Trp Pro Val Ala Leu Gly Arg
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Arg Tyr Gly Arg Val Ser Leu Ala Asn Glu Thr Asn Glu Leu Pro Pro
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Pro Thr Ala Asn Phe Thr Arg Leu Val Ser Met Phe Ala Ala Lys Gly
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Thr Ala His Cys Asn Leu Phe Ser Asp Arg Leu Tyr Asn Phe Thr Gly
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Ala Arg Leu Arg Ser Arg Cys Arg Ser Leu Ala Asp Asn Thr Thr Leu
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Asn Glu Met Asp Pro Gly Ser Phe Leu Ser Phe Asp Ser Ser Tyr Tyr
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Ser Leu Val Ala Arg Arg Gly Leu Phe His Ser Asp Ala Ala Leu
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Leu Thr Asp Pro Ala Thr Arg Ala Tyr Val Glu Arg Glu Ala Thr Gly
275
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898	ccc acg ctc aac tcc ggc tac cgg ggc ttc ctg gcc cag agg tgc ccc	Pro Thr Leu Asn Ser Gly Tyr Arg Ala Phe Leu Ala Gln Arg Cys Pro	230	235	240
946	cag aac ggc agc ccc tcg gcc ctc aac gac ctg gac ccc acg ccg	Gln Asn Gly Ser Pro Ser Ala Leu Asn Asp Leu Asp Pro Thr Pro	245	250	255
994	aac ctg ttc gac aac cac tac aac acc aac ctg gag gtc aac cgg ggc	Asn Leu Phe Asp Asn His Tyr Tyr Thr Asn Leu Gln Val Asn Arg Gly	260	265	270
1042	ttc ctc ggc tcg gac cag gag ctc aag tcg gcg cag cag ggc ggc	Phe Leu Gly Ser Asp Gln Gln Leu Lys Ser Ala Pro Gln Ala Gln Gly	280	285	290
1090	gtc acc gcg ccc gtc gtc gac cag ttc gcc acc agc cag gcc ggc ttc	Val Thr Ala Pro Val Val Asp Gln Phe Ala Thr Ser Gln Ala Phe	295	300	305
1138	ttc agc agc ttc gcg cag tcc atg aac atg ggc aac atc cag ccg	Phe Ser Ser Phe Ala Gln Ser Met Ile Asn Met Gly Asn Ile Gln Pro	310	315	320
1186	ctc acc gac ccg gcc aag gga gag gtc cgc tgc gac tgc cgg gtc gct	Leu Thr Asp Pro Ala Lys Gly Gln Val Arg Cys Asp Cys Arg Val Ala	325	330	335
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301	cag cag aac gtc cgt ctg acg gcg ggt ctg ctc ctc cgc ctc ctg ttg ttc cac	Gln Gln Asn Val Arg Leu Thr Ala Gly Leu Leu Arg Leu Leu phe His	65	70	75
349	gac tgc ttc cgc cag ggc tgc gac ggc tcc atc ctc ctg gac aac ggc	Asp Cys phe Pro Gln Gly Cys Asp Ala Ser Ile Leu Leu Asp Asn Gly	85	90	95
397	gag cgc ggc ctc ccg ccc aac gtg ggg ctg cag cag gag ggc gtg cag	Glu Arg Gly Leu Pro Pro Asn Val Gly Leu Gln Gln Gln Ala Val Gln	100	105	110
445	ctg gtg gag gac atc cgc ggg aag gtg cac gcg gcg tgc ggg ccc acc	Leu Val Gln Asp Ile Arg Gly Lys Val His Ala Ala Cys Gly Pro Thr	115	120	125
493	gtg tgc tgc ggc gac atc acg gtg gtc ggc acc cgc gac ggc gtg agc	Val Ser Cys Ala Asp Ile Thr Val Leu Ala Thr Arg Asp Ala Val Ser	130	135	140
541	ctg tcc ggc ggc ggg cct tcc ttc acg gtg ccg ctg ggg ctg gac agc	Leu Ser Gly Gly Pro Ser phe Thr Val Pro Leu Gly Arg Leu Asp Ser	145	150	155
589	gcg gcg cgc ccg ggc tcc agc aac gac gtg ttc acg ctg ccg ccg ccg ccg	Ala Ala Pro Ala Ser Ser Asn Asp Val phe Thr Leu Pro Pro Thr	165	170	175
637	gcg acg gtg gac gag ctg acg gcg ttc ggg agc aag aac ctg tcg	Ala Thr Val Asp Gln Leu Leu Thr Ala phe Gly Ser Lys Asn Leu Ser	180	185	190
685	gac ccg cgc gac gac ctg gtg gcg ctg gtc ggc ggc ggc cac acg gtg ggg aag	Asp Pro Ala Asp Leu Val Ala Leu Ser Gly Ala His Thr Val Gly Lys	195	200	205
733	gcg cgc ggc tgc agc tgc ttg ggc gac gac gtg gcg ggc ccg ggc acc gac gac	Ala Arg Cys Ser Ser phe Gly Asp Val Ala Gly Pro Ala Thr Asp Asp	210	215	220
781	gtg acg cgc cgc tgc gtg acg gcg gac gtc tgc tgc ggc ggc ccg ggg agc ggc gac	Val Thr Arg Cys Val Thr Ala Thr Cys Ser Ala Pro Gly Ser Gly Asp	225	230	235
829	acg ctg cgc ggc gac ctg gac ttc ctg acg ccc ggc gtc ttc gac aac ctg	Thr Leu Arg Asp Leu Asp phe Leu Thr Pro Ala Val phe Asp Asn Leu	245	250	255

877	tac ttc gtc gag ctg acg ctg aag aac aag ggg gtc atg ccg	Tyr phe Val Gln Leu Thr Leu Arg Lys Asn Lys Gly Val Met Leu Pro	260	265	270
925	tcg gac cag ggg ctg gtc agc gac ccg acg acg tgg ctg cag	Ser Asp Gln Gly Leu Val Ser Asp Pro Arg Thr Ser Trp Leu Val Gln	275	280	285
973	ggc ttc gcc gac aac cac tgg tgg ttc gac cag ttc agg acc tcc	Gly phe Ala Asp Asn His Trp Trp phe phe Asp Gln phe Arg Thr Ser	290	295	300
1021	atg atc aag atg agc cag ctg agg gga ccc cag ggg aac gtc ggc gag	Met Ile Lys Met Ser Gln Leu Arg Gly Pro Gln Gly Asn Val Gly Gln	310	315	320
1069	atc cgc cgt aac tgc ttc cgc cca aac acc aac ggc atc gcc gcc tct	Ile Arg Arg Asn Cys phe Arg Pro Asn Thr Asn Gly Ile Ala Ala Ser	325	330	335
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Ser Arg Pro Ala Ala Gly Asp Leu Ser Val Tyr phe His Ala Asp Ser	35	40	45		
Cys Pro Gln Leu Gln Thr Ile Val Arg Ser Ser Val Asp Ala Ala Leu	50	55	60		
Gln Gln Asn Val Arg Leu Thr Ala Gly Leu Leu Arg Leu Leu phe His	65	70	75		
Asp Cys phe Pro Gln Gly Cys Asp Ala Ser Ile Leu Leu Asp Asn Gly	85	90	95		
Gln Arg Gly Leu Pro Asn Val Gly Leu Gln Gln Ala Val Gln	100	105	110		
Leu Val Gln Asp Ile Arg Gly Lys Val His Ala Ala Cys Gly Pro Thr	115	120	125		
Val Ser Cys Ala Asp Ile Thr Val Leu Ala Thr Arg Asp Ala Val Ser	130	135	140		
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57	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	72
58	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	73
59	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	74
60	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	75
61	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	76
62	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	77
63	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	78
64	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	79
65	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	80
66	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	81
67	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	82
68	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	83
69	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	84
70	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	85
71	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	86
72	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	87
73	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	88
74	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	89
75	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	90
76	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	91
77	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	92
78	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	93
79	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	94
80	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	95
81	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	96
82	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	97
83	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	98
84	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	99
85	gyl	ala	ser	leu	leu	arg	leu	his	his	asp	cys	gln	gly	100

34

295 300 305 310

cag atc agg ctt acc tgc tcc aca gta aac taa gattaataat aatcaccata 1078
Gln Ile Arg Leu Thr Cys Ser Thr Val Asn *
315 320

cgcaaaaag agtggatat tcacatgcga ataataaggc taagccacca tgtgactagc 1138
tagtggata ttcaacgaat cgttgaaag ggaacgtgc gacttaatt ttagatacta 1198
ggtcaaaaag cggcatatat gtatcagccc gatcaattgc tcaagaagaaa gatgcacgctc 1258
atacatcca aaaaaaaaaa aaaaaa 1285

<210> 27
<211> 320
<212> PRT
<213> Zaa may

<400> 27
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1 5 10 15
Ala Ala Val Ala Ser Ala Gln Leu Ser Pro Thr Phe Tyr Asp Ser Ser
20 25 30
Cys Pro Asn Ala Leu Ser Thr Ile Lys Ser Ala Val Asn Ala Val
35 40 45
Gln Lys Gln Asn Arg Met Gly Ala Ser Leu Arg Leu His Phe His
50 55 60
Asp Cys Phe Val Gln Gly Cys Asp Ala Ser Val Leu Ala Asp Asn
65 70 75
Ala Ala Thr Gly Phe Thr Gly Gln Gly Ala Pro Asn Ala Gly
85 90 95
Ser Leu Arg Gly Phe Asp Val Ile Ala Asn Ile Lys Ala Gln Val Gln
100 105 110
Ala Val Cys Lys Gln Thr Val Ser Cys Ala Asp Ile Leu Ala Val Ala
115 120 125
Ala Arg Asp Ser Val Ala Leu Gly Gly Pro Ser Trp Thr Val Pro
130 135 140
Leu Gly Arg Asp Ser Thr Ala Ser Leu Ser Leu Ala Asn Ser
145 150 155
Asp Leu Pro Pro Phe Phe Asn Leu Gly Gln Leu Ile Thr Ala Phe
160 165 170 175
Gly Asn Lys Gly Phe Thr Ala Thr Gln Met Ala Thr Leu Ser Gly Ala
180 185 190 195
His Thr Ile Gly Gln Ala Gln Cys Lys Asn Phe Arg Asp His Ile Tyr
200 205
Asn Asp Thr Asn Ile Asn Gln Gly Phe Ala Ser Ser Leu Lys Ala Asn
210 215 220
Cys Pro Arg Pro Thr Gly Ser Gly Asp Gly Asn Leu Ala Pro Leu Asp
225 230 235
Thr Thr Thr Pro Tyr Ser Phe Asp Asn Ala Tyr Tyr Ser Asn Leu Leu
245 250 255
Ser Gln Lys Gly Leu Leu His Ser Asp Gln Gln Leu Phe Asn Gly Gly
260 265 270 275
Ser Thr Asp Asn Thr Val Arg Asn Phe Ala Ser Asn Ser Ala Ala Phe
280 285 290
Ser Ser Ala Phe Ala Ala Met Val Lys Met Gly Asn Leu Ser Pro
295 300
Leu Thr Gly Ser Gln Gly Gln Ile Arg Leu Thr Cys Ser Thr Val Asn

305

310

315

320

<210> 28

<211> 1159

<212> DNA

<213> Zea mays

<220>

<221> CDS

<222> (7)...(969)

<400> 28

gtggcg atg gca gta ctg cac ttg cag gcg gcg gcg gtg gcg gtg ctg 48

Met Ala Val Leu His Leu Gln Ala Ala Val Ala Val Leu

1

5

10

ctg atg gcg acg ggg ctg cgc gcg cag ctg cgt gtg ggc ttc tac gac 96

Leu Met Ala Thr Gly Leu Arg Ala Gln Leu Arg Val Gly Phe Tyr Asp

15

20

25

30

agc tcg tgc cca gcg gcg gag atc atc gtg cag cag gag gtg agc agg 144

Ser Ser Cys Pro Ala Ala Glu Ile Ile Val Gln Gln Glu Val Ser Arg

35

40

45

gcg gtg gcg gcc aac ccg ggc ctc gcc gcc ggc ctg ctc cgc ctc cac 192

Ala Val Ala Ala Asn Pro Gly Leu Ala Ala Gly Leu Leu Arg Leu His

50

55

60

ttc cac gac tgt ttc gtt ggg ggc tgc gac gcg tcc gtg ctc atc gac 240

Phe His Asp Cys Phe Val Gly Gly Cys Asp Ala Ser Val Leu Ile Asp

65

70

75

tcc acc aag ggc aac acc gcg gag aag gac gcc ggg ccc aac ctc agc 288

Ser Thr Lys Gly Asn Thr Ala Glu Lys Asp Ala Gly Pro Asn Leu Ser

80

85

90

ctg cgg ggc ttc gag gtc gtc gat cgc atc aag gcg cgc gtc gag cag 336

Leu Arg Gly Phe Glu Val Val Asp Arg Ile Lys Ala Arg Val Glu Gln

95

100

105

110

gcc tgc ttc ggc gtc gtc tcc tgc gcg gac ata ctc gcg ttc gcg gcc 384

Ala Cys Phe Gly Val Val Ser Cys Ala Asp Ile Leu Ala Phe Ala Ala

115

120

125

agg gac agc gtc gca ctc gcc ggc ggg aac gcg tac cag gtg ccg gcg 432

Arg Asp Ser Val Ala Leu Ala Gly Gly Asn Ala Tyr Gln Val Pro Ala

130

135

140

ggg cgg cgg gac ggg tcc gtg tcg cgc gcg tcg gac acc aac ggc aac 480

Gly Arg Arg Asp Gly Ser Val Ser Arg Ala Ser Asp Thr Asn Gly Asn

145

150

155

ctg ccg ccg ccg acg gcc aac gtc gcg cag ctc acg cag atc ttc ggc 528

Leu Pro Pro Pro Thr Ala Asn Val Ala Gln Leu Thr Gln Ile Phe Gly

160

165

170

acc aag ggc ctg acg cag aag gag atg gtc atc ctg tgc ggc gcg cac	576
Thr Lys Gly Leu Thr Gln Lys Glu Met Val Ile Leu Ser Gly Ala His	
175 180 185 190	
acc atc ggc tcc tgc cac tgc agc tcc ttc agc ggc cgg ctg tgc ggg	624
Thr Ile Gly Ser Ser His Cys Ser Ser Phe Ser Gly Arg Leu Ser Gly	
195 200 205	
tgc gcc acg acg gcg ggc ggg cag gac ccg acc atg gac ccg gcg tac	672
Ser Ala Thr Thr Ala Gly Gly Gln Asp Pro Thr Met Asp Pro Ala Tyr	
210 215 220	
gtg gcg cag ctg gcg cgg cag tgc ccg cag ggc ggc gac ccg ctc gtg	720
Val Ala Gln Leu Ala Arg Gln Cys Pro Gln Gly Gly Asp Pro Leu Val	
225 230 235	
ccc atg gac tac gtc tcc ccc aac gcc ttc gac gag ggc ttc tac aag	768
Pro Met Asp Tyr Val Ser Pro Asn Ala Phe Asp Glu Gly Phe Tyr Lys	
240 245 250	
ggc gtc atg tcc aac cgc ggc ctg ctg tcc tgc gac cag gcg ctg ctc	816
Gly Val Met Ser Asn Arg Gly Leu Leu Ser Ser Asp Gln Ala Leu Leu	
255 260 265 270	
agc gac aag aac acc gcc gtg cag gtc gtc acc tac gcc aac gac ccg	864
Ser Asp Lys Asn Thr Ala Val Gln Val Val Thr Tyr Ala Asn Asp Pro	
275 280 285	
gcc acc ttc cag gcc gac ttc gcc gcc gcc atg gtc aag atg ggc tcc	912
Ala Thr Phe Gln Ala Asp Phe Ala Ala Met Val Lys Met Gly Ser	
290 295 300	
gtc ggc gtg ctc acc ggc acc agc ggc aag gtc agg gcc aac tgc aga	960
Val Gly Val Leu Thr Gly Thr Ser Gly Lys Val Arg Ala Asn Cys Arg	
305 310 315	
gtc gcc tga tccatcatca tcattcactc gtgtggagtt gtagattcgt	1009
Val Ala *	
320	
tatattgatt gatttggacc ggacgacgtc gacgggatgg cgtagcatag catagtctgc	1069
ttgcgcaatt gtatgtattg cctgtacttg cgcgtgtatg ggtttcgctg tgcaaatttt	1129
cgttggctcc ccaaaaaaaaa aaaaaaaaaa	1159

<210> 29
 <211> 320
 <212> PRT
 <213> Zea mays

<400> 29
 Met Ala Val Leu His Leu Gln Ala Ala Ala Val Ala Val Leu Leu Met
 1 5 10 15
 Ala Thr Gly Leu Arg Ala Gln Leu Arg Val Gly Phe Tyr Asp Ser Ser
 20 25 30
 Cys Pro Ala Ala Glu Ile Ile Val Gln Gln Glu Val Ser Arg Ala Val
 35 40 45
 Ala Ala Asn Pro Gly Leu Ala Ala Gly Leu Leu Arg Leu His Phe His

50	Asp Cys Phe Val Gly Gly Cys Asp Ala Ser Val Leu Ile Asp Ser Thr	55	60
65	Lys Gly Asn Thr Ala Glu Lys Asp Ala Gly Pro Asn Leu Ser Leu Arg	70	75
		85	90
	Gly Phe Glu Val Val Asp Arg Ile Lys Ala Arg Val Glu Gln Ala Cys	100	105
		110	115
	Phe Gly Val Val Ser Cys Ala Asp Ile Leu Ala Phe Ala Ala Arg Asp	120	125
		130	135
	Ser Val Ala Leu Ala Gly Gly Asn Ala Tyr Gln Val Pro Ala Gly Arg	140	145
		150	155
	Arg Asp Gly Ser Val Ser Arg Ala Ser Asp Thr Asn Gly Asn Leu Pro	160	165
		170	175
	Pro Pro Thr Ala Asn Val Ala Gln Leu Thr Gln Ile Phe Gly Thr Lys	180	185
		190	195
	Gly Leu Thr Gln Lys Glu Met Val Ile Leu Ser Gly Ala His Thr Ile	200	205
		210	215
	Gly Ser Ser His Cys Ser Ser Phe Ser Gly Arg Leu Ser Gly Ser Ala	220	225
		230	235
	Thr Thr Ala Gly Gly Gln Asp Pro Thr Met Asp Pro Ala Tyr Val Ala	240	245
		250	255
	Gln Leu Ala Arg Gln Cys Pro Gln Gly Gly Asp Pro Leu Val Pro Met	260	265
		270	275
	Asp Tyr Val Ser Pro Asn Ala Phe Asp Glu Gly Phe Tyr Lys Gly Val	280	285
		290	295
	Met Ser Asn Arg Gly Leu Leu Ser Ser Asp Gln Ala Leu Leu Ser Asp	300	305
		310	315
	Lys Asn Thr Ala Val Gln Val Val Thr Tyr Ala Asn Asp Pro Ala Thr	320	
	Phe Gln Ala Asp Phe Ala Ala Met Val Lys Met Gly Ser Val Gly		
	Val Leu Thr Gly Thr Ser Gly Lys Val Arg Ala Asn Cys Arg Val Ala		

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 <213> Zea mays

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 gcggcgaggc caagggcgcg ggcgcgggcg cggacggca atg gcg aga gct gga 114
 Met Ala Arg Ala Gly
 1 5

ggc ggc ggt ccg gtc cgc ggc gcg gcg ctg gtg gtc gtg ctg cta ggc 162
 Gly Gly Gly Pro Val Arg Gly Ala Ala Leu Val Val Val Leu Leu Gly
 10 15 20

atc gtc gtg ggc gcg gcg agg gct cag ctg cgg cag aac tac tac ggc 210
 Ile Val Val Gly Ala Ala Arg Ala Gln Leu Arg Gln Asn Tyr Tyr Gly
 25 30 35

agc tcg tgc ccc agc gcg gag tcc acg gtg cgc tcc gtc atc tcg cag	258
Ser Ser Cys Pro Ser Ala Glu Ser Thr Val Arg Ser Val Ile Ser Gln	
40 45 50	
cgc ctc cag cag agc ttc gcc gtg ggg ccc ggc acg ctc cgc ctc ttc	306
Arg Leu Gln Gln Ser Phe Ala Val Gly Pro Gly Thr Leu Arg Leu Phe	
55 60 65	
ttc cac gac tgc ttc gtc agg gga tgc gac gcg tcg gtg atg ctg atg	354
Phe His Asp Cys Phe Val Arg Gly Cys Asp Ala Ser Val Met Leu Met	
70 75 80 85	
gcg ccg aac ggg gac gac gag agc cac agc ggc gcg gac gcc acg ctg	402
Ala Pro Asn Gly Asp Asp Glu Ser His Ser Gly Ala Asp Ala Thr Leu	
90 95 100	
tcg ccg gac gcc gtg gac gcc atc aac aag gcg aag gcg gcc gtg gag	450
Ser Pro Asp Ala Val Asp Ala Ile Asn Lys Ala Lys Ala Ala Val Glu	
105 110 115	
gcg ctc ccc ggg tgc gcc ggc aag gtc tcg tgc gcg gac atc ctc gcc	498
Ala Leu Pro Gly Cys Ala Gly Lys Val Ser Cys Ala Asp Ile Leu Ala	
120 125 130	
atg gcc gca cgt gac gtc gtc tcc ctg ctg ggc ggt ccg agc tac ggc	546
Met Ala Ala Arg Asp Val Val Ser Leu Leu Gly Gly Pro Ser Tyr Gly	
135 140 145	
gtg gag ctg ggg cgg ctg gac ggc aag acg ttc aac agg gcc atc gtg	594
Val Glu Leu Gly Arg Leu Asp Gly Lys Thr Phe Asn Arg Ala Ile Val	
150 155 160 165	
aag cac gtc ctc ccg ggc ccc ggc ttc aac ctg gac cag ctc aac gcc	642
Lys His Val Leu Pro Gly Pro Gly Phe Asn Leu Asp Gln Leu Asn Ala	
170 175 180	
ctc ttc gcg cag aac ggc ctc acg cag acg gac atg atc gcg ctc tca	690
Leu Phe Ala Gln Asn Gly Leu Thr Gln Thr Asp Met Ile Ala Leu Ser	
185 190 195	
ggc gcg cac acg atc ggg gtg acg cac tgc gac aag ttc gtg cgg cgg	738
Gly Ala His Thr Ile Gly Val Thr His Cys Asp Lys Phe Val Arg Arg	
200 205 210	
atc tac acg ttc aag cag cgg ctg gcg tgg aac ccg ccg atg aac ctg	786
Ile Tyr Thr Phe Lys Gln Arg Leu Ala Trp Asn Pro Pro Met Asn Leu	
215 220 225	
gac ttc ctg cgc tcg ctg cgg cgg gtg tgc ccc ctc agc tac agc ccc	834
Asp Phe Leu Arg Ser Leu Arg Arg Val Cys Pro Leu Ser Tyr Ser Pro	
230 235 240 245	
acg gcg ttc gcc atg ctg gac gtc acc acg ccc agg gtc ttc gac aac	882
Thr Ala Phe Ala Met Leu Asp Val Thr Thr Pro Arg Val Phe Asp Asn	
250 255 260	

gcc tac ttc aac aac ctc cgc tac aac aag ggc ctg ctc gcc tcc gac 930
Ala Tyr Phe Asn Asn Leu Arg Tyr Asn Lys Gly Leu Leu Ala Ser Asp
265 270 275

cag gtg ctc ttc acc gac cgc cgc tcc cga ccc acc gtc aac ctc ttc 978
Gln Val Leu Phe Thr Asp Arg Arg Ser Arg Pro Thr Val Asn Leu Phe
280 285 290

gcc gcc aac gcc acc gcc ttc tac gag gca ttc gtc gcc gcc atg gcc 1026
Ala Ala Asn Ala Thr Ala Phe Tyr Glu Ala Phe Val Ala Ala Met Ala
295 300 305

aag ctc ggc agg atc ggc ctc aag acc ggc gcc gac ggc gag ata cgc 1074
Lys Leu Gly Arg Ile Gly Leu Lys Thr Gly Ala Asp Gly Glu Ile Arg
310 315 320 325

cgc gtc tgc acc gcc gtc aac taa gcctgcattg gctgcttgct gcttgcgctgc 1128
Arg Val Cys Thr Ala Val Asn *
330

gtgggtttca cttatttcac ttcttctttc tcttgtttat atacgtacgt ttgtcggatg 1188
gattttggta gccatgagat gacatccttg ctctgagcta gcggacctgc cccgattgga 1248
tgatatagat tgatccagat gttcttctaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa 1308
aa 1310

<210> 31
<211> 332
<212> PRT
<213> Zea mays

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Met Ala Arg Ala Gly Gly Gly Gly Pro Val Arg Gly Ala Ala Leu Val
1 5 10 15
Val Val Leu Leu Gly Ile Val Val Gly Ala Ala Arg Ala Gln Leu Arg
20 25 30
Gln Asn Tyr Tyr Gly Ser Ser Cys Pro Ser Ala Glu Ser Thr Val Arg
35 40 45
Ser Val Ile Ser Gln Arg Leu Gln Gln Ser Phe Ala Val Gly Pro Gly
50 55 60
Thr Leu Arg Leu Phe Phe His Asp Cys Phe Val Arg Gly Cys Asp Ala
65 70 75 80
Ser Val Met Leu Met Ala Pro Asn Gly Asp Asp Glu Ser His Ser Gly
85 90 95
Ala Asp Ala Thr Leu Ser Pro Asp Ala Val Asp Ala Ile Asn Lys Ala
100 105 110
Lys Ala Ala Val Glu Ala Leu Pro Gly Cys Ala Gly Lys Val Ser Cys
115 120 125
Ala Asp Ile Leu Ala Met Ala Ala Arg Asp Val Val Ser Leu Leu Gly
130 135 140
Gly Pro Ser Tyr Gly Val Glu Leu Gly Arg Leu Asp Gly Lys Thr Phe
145 150 155 160
Asn Arg Ala Ile Val Lys His Val Leu Pro Gly Pro Gly Phe Asn Leu
165 170 175
Asp Gln Leu Asn Ala Leu Phe Ala Gln Asn Gly Leu Thr Gln Thr Asp
180 185 190
Met Ile Ala Leu Ser Gly Ala His Thr Ile Gly Val Thr His Cys Asp
195 200 205

Lys Phe Val Arg Arg Ile Tyr Thr Phe Lys Gln Arg Leu Ala Trp Asn
 210 215 220
 Pro Pro Met Asn Leu Asp Phe Leu Arg Ser Leu Arg Arg Val Cys Pro
 225 230 235 240
 Leu Ser Tyr Ser Pro Thr Ala Phe Ala Met Leu Asp Val Thr Thr Pro
 245 250 255
 Arg Val Phe Asp Asn Ala Tyr Phe Asn Asn Leu Arg Tyr Asn Lys Gly
 260 265 270
 Leu Leu Ala Ser Asp Gln Val Leu Phe Thr Asp Arg Arg Ser Arg Pro
 275 280 285
 Thr Val Asn Leu Phe Ala Ala Asn Ala Thr Ala Phe Tyr Glu Ala Phe
 290 295 300
 Val Ala Ala Met Ala Lys Leu Gly Arg Ile Gly Leu Lys Thr Gly Ala
 305 310 315 320
 Asp Gly Glu Ile Arg Arg Val Cys Thr Ala Val Asn
 325 330

<210> 32
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 <212> DNA
 <213> Zea mays

<220>
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 <222> (25) ... (1092)

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 Met Tyr Thr Ala Met Ala Ala Arg Pro
 1 5

ctg ctt ctt ccc cct ccg gtc ctc ctc ctc ctg gtg gtg ctg gct gct 99
 Leu Leu Leu Pro Pro Pro Val Leu Leu Leu Leu Val Val Leu Ala Ala
 10 15 20 25

tcg tcg gcc gcc cat ggc tac ggc gcc tac ggc tac ggc gac gct gct 147
 Ser Ser Ala Ala His Gly Tyr Gly Ala Tyr Gly Tyr Gly Asp Ala Ala
 30 35 40

gct gag ctc agg gtc ggg ttc tac aag gac tcg tgc ccg gac gcc gag 195
 Ala Glu Leu Arg Val Gly Phe Tyr Lys Asp Ser Cys Pro Asp Ala Glu
 45 50 55

gcc gtc gtc cgc agg atc gtc gcc aag gcc gtc caa gag gac ccc acg 243
 Ala Val Val Arg Arg Ile Val Ala Lys Ala Val Gln Glu Asp Pro Thr
 60 65 70

gcc aac gcg ccg ctg ctc agg ctc cac ttc cac gac tgc ttc gtc cgg 291
 Ala Asn Ala Pro Leu Leu Arg Leu His Phe His Asp Cys Phe Val Arg
 75 80 85

ggc tgc gac ggc tcc gtg ctc gtc aac tcc acc agg ggg aac acg gcg 339
 Gly Cys Asp Gly Ser Val Leu Val Asn Ser Thr Arg Gly Asn Thr Ala
 90 95 100 105

gag aag gac gcc aag ccc aac cac acg ctg gac gcc ttc gac gtc atc 387

Glu Lys Asp Ala Lys Pro Asn His Thr Leu Asp Ala Phe Asp Val Ile	
110 115 120	
gac gac atc aag gag gcg ctg gag aag cgc tgc ccg ggg acc gtc tcc	435
Asp Asp Ile Lys Glu Ala Leu Glu Lys Arg Cys Pro Gly Thr Val Ser	
125 130 135	
tgc gcc gac atc ctc gcc atc gcc gcc agg gac gcc gtc tcg ctg gcc	483
Cys Ala Asp Ile Leu Ala Ile Ala Ala Arg Asp Ala Val Ser Leu Ala	
140 145 150	
acc aag gtg gtg acc aag ggc ggc tgg agc agg gac ggc aac ctc tac	531
Thr Lys Val Val Thr Lys Gly Gly Trp Ser Arg Asp Gly Asn Leu Tyr	
155 160 165	
cag gtg gag acc ggc agg cgg gac ggc cgc gtg tcc aga gcc aag gag	579
Gln Val Glu Thr Gly Arg Arg Asp Gly Arg Val Ser Arg Ala Lys Glu	
170 175 180 185	
gcc gtc aag aac ttg ccg gac tcc atg gat ggc atc cgc aag ctc atc	627
Ala Val Lys Asn Leu Pro Asp Ser Met Asp Gly Ile Arg Lys Leu Ile	
190 195 200	
agg agg ttc gct tcc aag aac ctc agc gtc aag gat ctc gct gtt ctc	675
Arg Arg Phe Ala Ser Lys Asn Leu Ser Val Lys Asp Leu Ala Val Leu	
205 210 215	
tca ggc gcc cac gcg atc ggc aaa tcg cac tgc ccg tcg atc gcc aag	723
Ser Gly Ala His Ala Ile Gly Lys Ser His Cys Pro Ser Ile Ala Lys	
220 225 230	
cgg ctg cgc aac ttc acg gcg cac cgg gac agc gac ccg acc ctg gac	771
Arg Leu Arg Asn Phe Thr Ala His Arg Asp Ser Asp Pro Thr Leu Asp	
235 240 245	
ggc gcg tac gcg gcg gag ctg agg cgg cag tgc cgg agg cgc agg gac	819
Gly Ala Tyr Ala Ala Glu Leu Arg Arg Gln Cys Arg Arg Arg Asp	
250 255 260 265	
aac acg acg gag ctg gag atg gtg ccg ggg agc tcc acc gcg ttc ggc	867
Asn Thr Thr Glu Leu Glu Met Val Pro Gly Ser Ser Thr Ala Phe Gly	
270 275 280	
acg gcc tac tac ggc ctg gtc gcg gag cgg agg gcg ctc ttc cac tcc	915
Thr Ala Tyr Tyr Gly Leu Val Ala Glu Arg Arg Ala Leu Phe His Ser	
285 290 295	
gac gag gcg ctg ctc agg aac ggg gag acc agg gcg ctc gtc tac cgc	963
Asp Glu Ala Leu Leu Arg Asn Gly Glu Thr Arg Ala Leu Val Tyr Arg	
300 305 310	
tat agg gac gcg ccg tcc gag gcg gcg ttc ctc gcg gaa ttc ggg gcg	1011
Tyr Arg Asp Ala Pro Ser Glu Ala Ala Phe Leu Ala Glu Phe Gly Ala	
315 320 325	
tcc atg ctc aac atg ggc agg gtg ggc gtg ctc acc ggc gcc cag ggg	1059
Ser Met Leu Asn Met Gly Arg Val Gly Val Leu Thr Gly Ala Gln Gly	

330

335

340

345

gag atc agg aag agg tgc gcc ttt gtc aac tag ctagcgatat gctggattgt 1112
 Glu Ile Arg Lys Arg Cys Ala Phe Val Asn *

350

355

actttgtacc ctctcgccctt aattaaaaatt taaatgctgg agtttcacct aaaaaaaaaa 1170

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<211> 355

<212> PRT

<213> Zea mays

<400> 33

Met Tyr Thr Ala Met Ala Ala Arg Pro Leu Leu Leu Pro Pro Pro Val
 1 5 10 15
 Leu Leu Leu Leu Val Val Leu Ala Ala Ser Ser Ala Ala His Gly Tyr
 20 25 30
 Gly Ala Tyr Gly Tyr Gly Asp Ala Ala Ala Glu Leu Arg Val Gly Phe
 35 40 45
 Tyr Lys Asp Ser Cys Pro Asp Ala Glu Ala Val Val Arg Arg Ile Val
 50 55 60
 Ala Lys Ala Val Gln Glu Asp Pro Thr Ala Asn Ala Pro Leu Leu Arg
 65 70 75 80
 Leu His Phe His Asp Cys Phe Val Arg Gly Cys Asp Gly Ser Val Leu
 85 90 95
 Val Asn Ser Thr Arg Gly Asn Thr Ala Glu Lys Asp Ala Lys Pro Asn
 100 105 110
 His Thr Leu Asp Ala Phe Asp Val Ile Asp Asp Ile Lys Glu Ala Leu
 115 120 125
 Glu Lys Arg Cys Pro Gly Thr Val Ser Cys Ala Asp Ile Leu Ala Ile
 130 135 140
 Ala Ala Arg Asp Ala Val Ser Leu Ala Thr Lys Val Val Thr Lys Gly
 145 150 155 160
 Gly Trp Ser Arg Asp Gly Asn Leu Tyr Gln Val Glu Thr Gly Arg Arg
 165 170 175
 Asp Gly Arg Val Ser Arg Ala Lys Glu Ala Val Lys Asn Leu Pro Asp
 180 185 190
 Ser Met Asp Gly Ile Arg Lys Leu Ile Arg Arg Phe Ala Ser Lys Asn
 195 200 205
 Leu Ser Val Lys Asp Leu Ala Val Leu Ser Gly Ala His Ala Ile Gly
 210 215 220
 Lys Ser His Cys Pro Ser Ile Ala Lys Arg Leu Arg Asn Phe Thr Ala
 225 230 235 240
 His Arg Asp Ser Asp Pro Thr Leu Asp Gly Ala Tyr Ala Ala Glu Leu
 245 250 255
 Arg Arg Gln Cys Arg Arg Arg Arg Asp Asn Thr Thr Glu Leu Glu Met
 260 265 270
 Val Pro Gly Ser Ser Thr Ala Phe Gly Thr Ala Tyr Tyr Gly Leu Val
 275 280 285
 Ala Glu Arg Arg Ala Leu Phe His Ser Asp Glu Ala Leu Leu Arg Asn
 290 295 300
 Gly Glu Thr Arg Ala Leu Val Tyr Arg Tyr Arg Asp Ala Pro Ser Glu
 305 310 315 320
 Ala Ala Phe Leu Ala Glu Phe Gly Ala Ser Met Leu Asn Met Gly Arg
 325 330 335
 Val Gly Val Leu Thr Gly Ala Gln Gly Glu Ile Arg Lys Arg Cys Ala

Phe Val Asn 340
355

345

350

<210> 34
<211> 1391
<212> DNA
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<220>
<221> CDS
<222> (103)...(1089)

<400> 34

ggacgagact cgcagctagc tgacacggcc gagaagcagc ttgcattgca ggcgtagtac 60
gtaccagca gcagctagca ctagcagtc atcgagcga cg atg gtg aga agg 114
Met Val Arg Arg
1

acg gtg ctg gcg gcg ctg ctg gtg gcc gcc gcc ctc gcc ggc ggc gcg 162
Thr Val Leu Ala Ala Leu Leu Val Ala Ala Ala Leu Ala Gly Gly Ala
5 10 15 20

cgg gcg cag ctc aag gag ggg ttc tac gac tac tcc tgc cca cag gcg 210
Arg Ala Gln Leu Lys Glu Gly Phe Tyr Asp Tyr Ser Cys Pro Gln Ala
25 30 35

gag aag atc gtc aag gac tac gtg aag gcg cac atc ccc cac gcg ccc 258
Glu Lys Ile Val Lys Asp Tyr Val Lys Ala His Ile Pro His Ala Pro
40 45 50

gac gtc gcc tcc acc ctg ctc cgc acc cac ttc cac gac tgc ttc gtc 306
Asp Val Ala Ser Thr Leu Leu Arg Thr His Phe His Asp Cys Phe Val
55 60 65

agg ggc tgc gac gcg tca gtg ctg ctc aac gcg acg ggc ggc agc gag 354
Arg Gly Cys Asp Ala Ser Val Leu Leu Asn Ala Thr Gly Gly Ser Glu
70 75 80

gcg gag aag gac gcg gcg ccc aac ctg acg ctg cgc ggc ttc ggc ttc 402
Ala Glu Lys Asp Ala Ala Pro Asn Leu Thr Leu Arg Gly Phe Gly Phe
85 90 95 100

atc gac cgc atc aag gcg ctg ctc gag aag gag tgc ccc ggc gtg gtg 450
Ile Asp Arg Ile Lys Ala Leu Leu Glu Lys Glu Cys Pro Gly Val Val
105 110 115

tcc tgc gcc gac atc gtc gcg ctc gcc gcc cgc gac tcc gtc ggc gtc 498
Ser Cys Ala Asp Ile Val Ala Leu Ala Ala Arg Asp Ser Val Gly Val
120 125 130

atc ggc ggt ccg ttc tgg agc gtg ccg acg ggg agg cgc gac ggc acc 546
Ile Gly Gly Pro Phe Trp Ser Val Pro Thr Gly Arg Arg Asp Gly Thr
135 140 145

gtg tcc atc aag cag gag gcg ctg gac cag atc ccc gcg ccc acc atg 594

Val	Ser	Ile	Lys	Gln	Glu	Ala	Leu	Asp	Gln	Ile	Pro	Ala	Pro	Thr	Met	
150						155					160					
aac	ttc	acc	caa	ctc	ctc	cag	tcc	ttc	cag	aac	aag	agc	ctc	aac	ctc	642
Asn	Phe	Thr	Gln	Leu	Leu	Gln	Ser	Phe	Gln	Asn	Lys	Ser	Leu	Asn	Leu	
165					170					175					180	
gcc	gac	ctc	gtc	tgg	ctc	tca	ggg	gct	cac	acg	atc	ggc	atc	tcc	caa	690
Ala	Asp	Leu	Val	Trp	Leu	Ser	Gly	Ala	His	Thr	Ile	Gly	Ile	Ser	Gln	
				185					190					195		
tgc	aac	tcc	ttc	agc	gag	cgc	ctg	tac	aac	ttc	acg	ggg	cgc	ggc	ggg	738
Cys	Asn	Ser	Phe	Ser	Glu	Arg	Leu	Tyr	Asn	Phe	Thr	Gly	Arg	Gly	Gly	
			200					205					210			
ccc	gac	gac	gcg	gac	ccg	tcg	ctg	gac	ccg	ctg	tac	gcc	gcg	aag	ttg	786
Pro	Asp	Asp	Ala	Asp	Pro	Ser	Leu	Asp	Pro	Leu	Tyr	Ala	Ala	Lys	Leu	
			215				220					225				
cgg	ctc	aag	tgc	aag	acg	ctg	acg	gac	aac	acg	acg	atc	gtg	gag	atg	834
Arg	Leu	Lys	Cys	Lys	Thr	Leu	Thr	Asp	Asn	Thr	Thr	Ile	Val	Glu	Met	
			230			235						240				
gac	ccc	ggc	agc	ttc	cgc	acc	ttc	gac	ctg	agc	tac	tac	cgc	ggc	gtg	882
Asp	Pro	Gly	Ser	Phe	Arg	Thr	Phe	Asp	Leu	Ser	Tyr	Tyr	Arg	Gly	Val	
					250					255					260	
ctc	aag	cgg	cgg	ggc	ctg	ttc	cag	tcc	gac	gcc	gcg	ctc	atc	acc	gac	930
Leu	Lys	Arg	Arg	Gly	Leu	Phe	Gln	Ser	Asp	Ala	Ala	Leu	Ile	Thr	Asp	
				265					270					275		
gcc	gcc	tcc	aag	gcc	gac	atc	ctc	agc	gtg	atc	aac	gcg	ccg	ccc	gag	978
Ala	Ala	Ser	Lys	Ala	Asp	Ile	Leu	Ser	Val	Ile	Asn	Ala	Pro	Pro	Glu	
			280					285				290				
gtg	ttc	ttc	cag	gtc	ttc	gcg	ggc	tcc	atg	gtc	aag	atg	ggc	gcc	atc	1026
Val	Phe	Phe	Gln	Val	Phe	Ala	Gly	Ser	Met	Val	Lys	Met	Gly	Ala	Ile	
			295				300					305				
gag	gtc	aag	acc	ggc	tcc	gag	ggc	gag	atc	agg	aag	cac	tgc	gcc	ctc	1074
Glu	Val	Lys	Thr	Gly	Ser	Glu	Gly	Glu	Ile	Arg	Lys	His	Cys	Ala	Leu	
		310				315				320						
gtc	aac	aag	cac	tag	gcggcggaat	tcattgcggga	gatggctcca	ttgctcgcaa								1129
Val	Asn	Lys	His	*												
325																
aaaaatcctt	gtgagacaca	caacatgctc	tgcattctgca	ggcgttgctg	tcaccttggt											1189
ggacgtagta	catcggtgca	tggattatct	gttggttaaat	ttgtacgttc	agttcattct											1249
gtttcttgta	ttcttttggt	tcctttcctc	ttgtttattc	atggatgatg	aggtgtttct											1309
gttttattct	ctggttcagc	tgtaccatg	taacatgtaa	ggtgcgcgtt	ttgtcctaaa											1369
aaaaaaaaaa	aaaaaaaaaa	aa														1391

<210> 35
 <211> 328
 <212> PRT
 <213> Zea mays

<400> 35
Met Val Arg Arg Thr Val Leu Ala Ala Leu Leu Val Ala Ala Ala Leu
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Ala Gly Gly Ala Arg Ala Gln Leu Lys Glu Gly Phe Tyr Asp Tyr Ser
20 25 30
Cys Pro Gln Ala Glu Lys Ile Val Lys Asp Tyr Val Lys Ala His Ile
35 40 45
Pro His Ala Pro Asp Val Ala Ser Thr Leu Leu Arg Thr His Phe His
50 55 60
Asp Cys Phe Val Arg Gly Cys Asp Ala Ser Val Leu Leu Asn Ala Thr
65 70 75 80
Gly Gly Ser Glu Ala Glu Lys Asp Ala Ala Pro Asn Leu Thr Leu Arg
85 90 95
Gly Phe Gly Phe Ile Asp Arg Ile Lys Ala Leu Leu Glu Lys Glu Cys
100 105 110
Pro Gly Val Val Ser Cys Ala Asp Ile Val Ala Leu Ala Ala Arg Asp
115 120 125
Ser Val Gly Val Ile Gly Gly Pro Phe Trp Ser Val Pro Thr Gly Arg
130 135 140
Arg Asp Gly Thr Val Ser Ile Lys Gln Glu Ala Leu Asp Gln Ile Pro
145 150 155 160
Ala Pro Thr Met Asn Phe Thr Gln Leu Leu Gln Ser Phe Gln Asn Lys
165 170 175
Ser Leu Asn Leu Ala Asp Leu Val Trp Leu Ser Gly Ala His Thr Ile
180 185 190
Gly Ile Ser Gln Cys Asn Ser Phe Ser Glu Arg Leu Tyr Asn Phe Thr
195 200 205
Gly Arg Gly Gly Pro Asp Asp Ala Asp Pro Ser Leu Asp Pro Leu Tyr
210 215 220
Ala Ala Lys Leu Arg Leu Lys Cys Lys Thr Leu Thr Asp Asn Thr Thr
225 230 235 240
Ile Val Glu Met Asp Pro Gly Ser Phe Arg Thr Phe Asp Leu Ser Tyr
245 250 255
Tyr Arg Gly Val Leu Lys Arg Arg Gly Leu Phe Gln Ser Asp Ala Ala
260 265 270
Leu Ile Thr Asp Ala Ala Ser Lys Ala Asp Ile Leu Ser Val Ile Asn
275 280 285
Ala Pro Pro Glu Val Phe Phe Gln Val Phe Ala Gly Ser Met Val Lys
290 295 300
Met Gly Ala Ile Glu Val Lys Thr Gly Ser Glu Gly Glu Ile Arg Lys
305 310 315 320
His Cys Ala Leu Val Asn Lys His
325

<210> 36
<211> 1476
<212> DNA
<213> Zea mays

<220>
<221> CDS
<222> (259) ... (1236)

<400> 36
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60

gtacccggcc gctgggactg caagagtggg gagtgagacg ctgctgctgt tgccgagcgc	120
gaggagacac tactactcac tcaagagtca agactcaaca gcagcagggg cgaccgagct	180
ctgctgctgt ggggagaacc ggagaaggca gcagaggagg gagggaggga gcgctgtggac	240
caggctaggc gcagcagc atg ggc gcc ggg atc agg gtc ctg gcg gcg ctc	291
Met Gly Ala Gly Ile Arg Val Leu Ala Ala Leu	
1 5 10	
ttg gcg gcg ctc gcg gca gcc acc gcc ggc ctg acg gcg cag ctg cgg	339
Leu Ala Ala Leu Ala Ala Ala Thr Ala Gly Leu Thr Ala Gln Leu Arg	
15 20 25	
cag gac tac tac gcg gct gtg tgc ccg gac ctg gag agc atc gtg cgc	387
Gln Asp Tyr Tyr Ala Ala Val Cys Pro Asp Leu Glu Ser Ile Val Arg	
30 35 40	
gcc gcg gtg tcc aag aag gtg cag gcg cag ccc gtc gcc gtg ggc gcc	435
Ala Ala Val Ser Lys Lys Val Gln Ala Gln Pro Val Ala Val Gly Ala	
45 50 55	
acc atc cgc ctc ttc ttc cac gac tgc ttc gtc gag ggc tgc gac gcg	483
Thr Ile Arg Leu Phe Phe His Asp Cys Phe Val Glu Gly Cys Asp Ala	
60 65 70 75	
tcg gtg atc ctg gtg tcc acg ggg aac aac acg gcg gag aag gac cac	531
Ser Val Ile Leu Val Ser Thr Gly Asn Asn Thr Ala Glu Lys Asp His	
80 85 90	
ccg agc aac ctc tcc ctg gcc ggc gac ggc ttc gac acc gtc atc cag	579
Pro Ser Asn Leu Ser Leu Ala Gly Asp Gly Phe Asp Thr Val Ile Gln	
95 100 105	
gcc aag gcg gcc gtg gac gcc gtg ccg gcg tgc gcc aac cag gtg tcg	627
Ala Lys Ala Ala Val Asp Ala Val Pro Ala Cys Ala Asn Gln Val Ser	
110 115 120	
tgc gcc gac atc ctg gcg ctg gcc acc ccg gac gtc att gag ctg gct	675
Cys Ala Asp Ile Leu Ala Leu Ala Thr Arg Asp Val Ile Glu Leu Ala	
125 130 135	
ggc ggg ccg tcg tac gcg gtg gag ctg ggg agg ctg gac ggg ctg gtg	723
Gly Gly Pro Ser Tyr Ala Val Glu Leu Gly Arg Leu Asp Gly Leu Val	
140 145 150 155	
tcc atg tcc acc aac gtc gac ggc aag ctg ccg ccg ccg tcc ttc aac	771
Ser Met Ser Thr Asn Val Asp Gly Lys Leu Pro Pro Pro Ser Phe Asn	
160 165 170	
ctg gac cag ctg acg agc att ttc gcc ctc aac aac ctg tcg cag gcc	819
Leu Asp Gln Leu Thr Ser Ile Phe Ala Leu Asn Asn Leu Ser Gln Ala	
175 180 185	
gac atg att gct tta tct gcg gcg cac acg gtg ggg ttc gcg cac tgc	867
Asp Met Ile Ala Leu Ser Ala Ala His Thr Val Gly Phe Ala His Cys	
190 195 200	
agc acg ttc tcg gac ccg atc cag ccg cag tcg gtg gac ccg acg atg	915
Ser Thr Phe Ser Asp Arg Ile Gln Pro Gln Ser Val Asp Pro Thr Met	

205	210	215	
aac gcg acg tac gcg gag gac ctg cag gcg gcg tgc ccg gcg ggg gtg			963
Asn Ala Thr Tyr Ala Glu Asp Leu Gln Ala Ala Cys Pro Ala Gly Val			
220	225	230	235
gac ccc aac atc gcg ctg cag ctg gac ccc gtg acg ccg cag gcc ttc			1011
Asp Pro Asn Ile Ala Leu Gln Leu Asp Pro Val Thr Pro Gln Ala Phe			
	240	245	250
gac aac cag tac ttc gcc aac ctg gtg gac ggc cgg ggg ctc ttc gcc			1059
Asp Asn Gln Tyr Phe Ala Asn Leu Val Asp Gly Arg Gly Leu Phe Ala			
	255	260	265
tcc gac cag gtg ctc ttc tcc gac gcg cgg tcg cag ccc acc gtg gtg			1107
Ser Asp Gln Val Leu Phe Ser Asp Ala Arg Ser Gln Pro Thr Val Val			
	270	275	280
gcg tgg gcg cag aac gcc acc gac ttc gag cag gcc ttc gtc gac gcc			1155
Ala Trp Ala Gln Asn Ala Thr Asp Phe Glu Gln Ala Phe Val Asp Ala			
	285	290	295
atc acc agg ctc ggc cgc gtc ggc gtc aag acc gac ccg tcg ctg ggg			1203
Ile Thr Arg Leu Gly Arg Val Gly Val Lys Thr Asp Pro Ser Leu Gly			
300	305	310	315
gac gtc cgc cgc gac tgc gcc ttc ctc aac tga aaaaggatga taagcgctag			1256
Asp Val Arg Arg Asp Cys Ala Phe Leu Asn *			
	320	325	
ctagtaggtg taagcatcgg ctggcactca cctggaggaa gaggccggct tttggtcagt			1316
ggtgacatct gatggatgtc caatcacgca ggatgccaaa aggccacgc ctacgcatat			1376
gaacggtgaa ataatagcga ctctaaatag caaacactgc tggagggtc tttggacgcta			1436
agaaacgcta catcttctcg caaaaaaaaa aaaaaaaaaa			1476

<210> 37
 <211> 325
 <212> PRT
 <213> Zea mays

<400> 37
 Met Gly Ala Gly Ile Arg Val Leu Ala Ala Leu Leu Ala Ala Leu Ala
 1 5 10 15
 Ala Ala Thr Ala Gly Leu Thr Ala Gln Leu Arg Gln Asp Tyr Tyr Ala
 20 25 30
 Ala Val Cys Pro Asp Leu Glu Ser Ile Val Arg Ala Ala Val Ser Lys
 35 40 45
 Lys Val Gln Ala Gln Pro Val Ala Val Gly Ala Thr Ile Arg Leu Phe
 50 55 60
 Phe His Asp Cys Phe Val Glu Gly Cys Asp Ala Ser Val Ile Leu Val
 65 70 75 80
 Ser Thr Gly Asn Asn Thr Ala Glu Lys Asp His Pro Ser Asn Leu Ser
 85 90 95
 Leu Ala Gly Asp Gly Phe Asp Thr Val Ile Gln Ala Lys Ala Ala Val
 100 105 110
 Asp Ala Val Pro Ala Cys Ala Asn Gln Val Ser Cys Ala Asp Ile Leu
 115 120 125

Ala	Leu	Ala	Thr	Arg	Asp	Val	Ile	Glu	Leu	Ala	Gly	Gly	Pro	Ser	Tyr
130						135					140				
Ala	Val	Glu	Leu	Gly	Arg	Leu	Asp	Gly	Leu	Val	Ser	Met	Ser	Thr	Asn
145					150					155					160
Val	Asp	Gly	Lys	Leu	Pro	Pro	Pro	Ser	Phe	Asn	Leu	Asp	Gln	Leu	Thr
			165						170					175	
Ser	Ile	Phe	Ala	Leu	Asn	Asn	Leu	Ser	Gln	Ala	Asp	Met	Ile	Ala	Leu
		180						185					190		
Ser	Ala	Ala	His	Thr	Val	Gly	Phe	Ala	His	Cys	Ser	Thr	Phe	Ser	Asp
	195					200						205			
Arg	Ile	Gln	Pro	Gln	Ser	Val	Asp	Pro	Thr	Met	Asn	Ala	Thr	Tyr	Ala
210						215					220				
Glu	Asp	Leu	Gln	Ala	Ala	Cys	Pro	Ala	Gly	Val	Asp	Pro	Asn	Ile	Ala
225					230					235					240
Leu	Gln	Leu	Asp	Pro	Val	Thr	Pro	Gln	Ala	Phe	Asp	Asn	Gln	Tyr	Phe
			245						250					255	
Ala	Asn	Leu	Val	Asp	Gly	Arg	Gly	Leu	Phe	Ala	Ser	Asp	Gln	Val	Leu
		260						265					270		
Phe	Ser	Asp	Ala	Arg	Ser	Gln	Pro	Thr	Val	Val	Ala	Trp	Ala	Gln	Asn
	275						280					285			
Ala	Thr	Asp	Phe	Glu	Gln	Ala	Phe	Val	Asp	Ala	Ile	Thr	Arg	Leu	Gly
290					295						300				
Arg	Val	Gly	Val	Lys	Thr	Asp	Pro	Ser	Leu	Gly	Asp	Val	Arg	Arg	Asp
305					310					315					320
Cys	Ala	Phe	Leu	Asn											
			325												